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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of

Docket No: Q62613

Yoshihito ASAO, et al.

Appln. No.: 09/769,408

Group Art Unit: 2834

Confirmation No.: 4699

Examiner: Hanh N. NGUYEN

Filed: January 26, 2001

For: AUTOMOTIVE ALTERNATOR

SUBMISSION OF APPELLANT'S BRIEF ON APPEAL

Commissioner for Patents
Washington, D.C. 20231

Sir:

Submitted herewith please find an original and two copies of Appellant's Brief on Appeal. A check for the statutory fee of $320.00 is attached. The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account. A duplicate copy of this paper is attached.

Respectfully submitted,

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Attorney Docket No.: Q62613

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APPELLANTS' BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Commissioner for Patents
Washington, D.C. 20231

Sir:

This is an Appeal from the final rejection of September 20, 2002 of claims 1-19 in Application No. 09/769,408. In accordance with the provisions of 37 C.F.R. § 1.192, Appellant submits the following:

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Mitsubishi Denki Kabushiki Kaisha. Assignment of the application was submitted to the U.S. Patent and Trademark Office on June 26, 2001, and recorded on the same date at Reel 011486, Frame 0837.

II. RELATED APPEALS AND INTERFERENCES

There are no known appeals or interferences that will affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-19 are pending in the application. As set forth in the Office Action dated September 20, 2002, claims 1, 2, 4, 5, 11, 12 and 14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art in view of Umeda et al. (USP 6,011,332; hereafter "Umeda") and Hiroshi (EP 0671801). Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art in view of Umeda, Hiroshi and Kato et al. (USP 6,140,735; hereafter "Kato"). Claim 3 is rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art in view of Umeda, Hiroshi and Yoshioka (USP 5,977,668). Claims 6-8 and 15-17 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art in view of Umeda, Hiroshi and Tanaka et al. (USP 5,235,229; hereafter "Tanaka"). Claims 9 and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art in view of Umeda, Hiroshi, Tanaka and Ishida et al. (USP 5,561,334; hereafter "Ishida"). Claims 10 and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art in view of Umeda, Hiroshi, Tanaka and Yoshioka. All of the rejected claims are set forth in the attached Appendix.

IV. STATUS OF AMENDMENTS

No claim amendments were requested subsequent to the Office Action of September 20, 2002.

V. SUMMARY OF THE INVENTION

The present invention is directed to an automotive alternator provided with blowing means for cooling coil ends of a stator coil, a rectifier and a regulator. (page 6, lines 4-14).

As shown in Figure 1, a front-end fan 40 functioning as a front-end blowing means is fastened to a front-end surface of the front-end pole core 20 of the rotor 7, and a rear-end fan 41 functioning as a rear-end blowing means is fastened to a rear-end surface of the rear-end pole core 21 of the rotor 7. (page 14, lines 3-7). In order to cool the heat generated by power generation, front-end and rear-end air intake apertures 1a and 2a and front-end and rear-end air discharge apertures 1b and 2b are disposed in the front bracket 1 and the rear bracket 2. (page 3, lines 23-26).

At the rear end and the front end, cooling air flows through a rear-end ventilation pathway and a front-end ventilation pathway, respectively, as indicated by arrows in Figure 1. In particular, external air is sucked into the case 3 through the rear-end air intake apertures 2a by rotation of the rear-end fan 41, cooling a rectifier 12 and a regulator 18, and is then deflected centrifugally by the rear-end fan 41, cooling the rear-end coil end group 16r of a stator coil 16 before being expelled to the outside through the rear-end air discharge apertures 2b. (page 4,

lines 7-12). At the same time, cooling air flows through a front-end ventilation pathway as indicated by arrows in Figure 1, external air is sucked into the case 3 through the front-end air intake apertures 1a by rotation of the front-end fan 40 and is then deflected centrifugally by the front-end fan 40, cooling a front-end coil end group 16f of a stator coil 16 before being expelled to the outside through the front-end air discharge apertures 1b. (page 4, lines 12-18). Further, as a result of a pressure difference between the front end and the rear end, a portion of the cooling air entering the front end air intake apertures 1a flows to the rear end through the inside of a rotor 7 and is expelled through the rear-end air discharge apertures 2b. (page 4, lines 18-20).

As shown in Figure 2, the rear-end fan 41 has a greater capacity than the front-end fan 40, wherein the capacity of each fan is defined as the magnitude of a pressure difference upstream and downstream from the fan for a predetermined flow rate, capacity being considered greater if the resulting pressure difference is greater for an identical flow rate. (page 14, lines 7-14). A front-end air flow rate Q3 of the cooling air flowing through the front-end ventilation pathway achieved by the front-end fan 40 is greater than a rear-end air flow rate Q2 of the cooling air flowing through the rear-end ventilation pathway achieved by the rear-end fan 41. Further, a front-end air flow pressure P3 achieved by the front-end fan 40 is less than a rear-end air flow pressure P2 achieved by the rear-end fan 41. (page 17, lines 13-20). Here, "air flow pressure" means the difference between the pressure generated in front of a resistant member disposed in the cooling air flow created by operation of the fan and that generated behind the resistant member. The greater the air flow pressure, the greater the capacity of the fan is

enhanced. (page 18, lines 6-10). In this manner, in accordance with a first embodiment of the present invention, the front-end air flow rate is greater than the rear-end air flow rate, and the capacity of the rear-end fan 41 is greater than the capacity of the front-end fan 40. (page 18, lines 21-23).

Because the front-end air flow rate is greater than the rear-end air flow rate, the stator coil 36 can be sufficiently cooled, enabling temperature increases in the stator coil 36 to be suppressed. Further, because the capacity of the rear-end fan 41 is greater than the capacity of the front-end fan 40, the rear-end air flow rate is sufficiently ensured and the rectifier 12 and the regulator 18 can be sufficiently cooled, enabling temperature increases in the rectifier 12 and the regulator 18 to be suppressed. In addition, because the air flow rate at the front end where wind resistance is small is made greater than the air flow rate at the rear end where wind resistance is great, the automotive alternator enables a worsening of wind noise to be suppressed. (page 18, line 24 - page 19, line 11).

VI. ISSUES

Whether independent claims 1 and 14 were erroneously rejected under 35 U.S.C. § 103(a) as being unpatentable over the applicant's admitted prior art in view of Umeda and Hiroshi?

VII. GROUPING OF CLAIMS

Appellant submits that claims 1-19 stand and fall together. Reasons for patentability are set forth below.

VIII. ARGUMENTS

For the reasons set forth below, Appellant respectfully submits that the claimed invention would not have been rendered obvious under 35 U.S.C. § 103 in view of the combined teachings the applicant's admitted prior art, Umeda and Hiroshi.

Independent claim 1 requires, in part, "front-end and rear-end blowing means are disposed at front and rear axial ends of said rotor, respectively, ... wherein a capacity of said rear-end blowing means is greater than a capacity of said front-end blowing means, and a front-end air intake flow rate is greater than a rear-end air intake flow rate."

Independent claim 14 requires, in part, "front-end and rear-end blowing means are disposed at front and rear axial ends of said rotor, respectively, ... wherein a capacity of said rear-end blowing means is greater than a capacity of said front-end blowing means, and a front-end air discharge flow rate is greater than a rear-end air discharge flow rate."

As set forth in the Office Action dated September 20, 2002, the Examiner maintains that the combination of applicant's admitted prior art and Umeda disclose all of the features of independent claim 1 except for a capacity of the rear-end blowing means is greater than a capacity of the front-end blowing means, and front-end air intake and discharge flow rates are

greater than rear-end air intake and discharge flow rates, which the Examiner asserts is disclosed by Hiroshi. (pages 2-5 of Office Action dated September 20, 2002). Appellant respectfully submits the claimed invention would not have been rendered obvious in view of the combined references because Hiroshi does not teach or suggest "a front-end air intake flow rate is greater than a rear-end air intake flow rate", as recited in claim 1, or "a front-end air discharge flow rate is greater than a rear-end air discharge flow rate", as recited in claim 14.

Hiroshi is directed to enhancing the endurance of a bearing disposed at a pulley-side of an alternator and preventing a bearing disposed at a non-pulley-side of the alternator from creeping. (Hiroshi: column 3, lines 3-10). As shown in Figure 1 of Hiroshi, an air intake window H1b and an air outlet window H0d are formed in the pulley-side (front-end) housing 1 and air intake window H1a and H1c and air outlet windows H0a, H0b and H0c are formed in the counter pulley-side (rear-end) housing 2. A first (front-end) cooling fan 8 and a second (rear-end) cooling fan 8' are disposed on corresponding sides of a rotor 31. (Hiroshi: column 4 line 34 - column 5, line 1). Similar to the conventional alternator illustrated in Figure 25 of the present application, blades of the rear-end cooling fan 8' appear to be larger than blades of the front-end cooling fan 8 in Figure 1 of Hiroshi. However, the specification of Hiroshi is silent on fan capacity or air flow rate.

The Examiner contends that Hiroshi discloses a capacity of the rear-end cooling fan 8' is greater than the capacity of the front-end cooling fan 8 because Figure 1 of Hiroshi shows the blades of the rear-end cooling fan 8' have a "greater size than the size of" the front-end cooling

fan 8. (Office Action dated September 20, 2002: page 4, first full paragraph). With regards to independent claim 1, the Examiner further contends that Hiroshi discloses the front-end air intake flow rate is greater than the rear-end air intake flow rate because Figure 1 of Hiroshi shows "there are many air resistant objects" between the rear-end air intake aperture and the rear-end fan and the distance from the rear-end air intake aperture to the rear-end fan "is so long that the resistance to the air flow is large [such that] the air flow rate becomes small". (Office Action dated September 20, 2002: page 4, first full paragraph, and paragraph bridging pages 12 and 13). With regards to claim 14, the Examiner contends Hiroshi inherently discloses a front-end air discharge rate which is greater than a rear-end air discharge rate since Hiroshi discloses the front-end air intake rate is greater than a rear-end discharge flow rate. (Office Action dated September 20, 2002: page 5, first full paragraph). Lastly, the Examiner postulates that since

> there is virtually no difference between the structure of Fig. 1 of the present invention and the structure disclosed by Hiroshi (both have greater aperture size on the rear end, both have rear-end blowing means greater than front-end blowing means, both have long air way[s] between rear aperture to fan blades, both have many resistance objects in the rear end, both have short and clear air way[s] in the front end), if the embodiment of present invention has "a capacity of said rear-end blowing means is greater than a capacity of said front-end blowing means, and a front-end air intake flow rate is greater than a rear-end air intake flow rate", it would make sense to assert that the structure of Hiroshi also has those features.

(Office Action dated September 20, 2002: page 14, lines 6-7). However, Appellant notes that the Examiner appears to be completely ignoring Figures 2 and 6-18 of the present application which illustrate how the present invention achieves front-end air intake and discharge flow rates which are greater than rear-end intake and discharge flow rates when a capacity of the rear-end blowing means is greater than a capacity of the front-end blowing means.

As discussed above, Hiroshi does not discuss in any manner fan capacity and air flow rates, or the problems associated therewith. Consequently, Appellant submits that any determination regarding the relationship between the capacity of the rear-end blowing means and the capacity of the front-end blowing means, the relationship between the front-end air intake flow rate and the rear-end air intake flow rate, and the relationship between the front-end air discharge flow rate and the rear-end air discharge flow rate is subjective conjecture made on the basis of drawings alone.

Although it may be possible to speculate that in the Hiroshi alternator, the capacity of the rear-end fan 8' is greater than the capacity of front-end fan 8 since the blades of the rear-end cooling fan 8' appear to be larger than blades of the front-end cooling fan 8 in Figure 1 of Hiroshi, fan blade size (e.g., blade height and blade chord length) is not the only factor that is determinative of fan capacity. That is, by providing a greater number of blades on the rear-end fan than the front-end fan, the capacity of the rear-end fan may be greater than the capacity of the front-end fan when the blade sizes are front-end and rear-end fans are the same (e.g., see Inventive Example 4 on page 23 of the present application). Further, fan capacity is determined by other factors including blade pitch, shielding plates, fan diameter and base plate shape (e.g., see Inventive Examples 3, 6 and 7 of the present application).

Moreover, Appellant respectfully submits that Hiroshi does not provide any teaching or suggestion that would lead one of ordinary skill in the art to believe the alternator of Hiroshi

provides front-end air intake and discharge flow rates which are greater than rear-end air intake and discharge flow rates, as the Examiner asserts.

For example, similar to Figure 1 of Hiroshi, Figure 25 of the present application illustrates a conventional alternator wherein the blades of the rear-end fan 5B appear to be larger than the blades of the front-end fan 5A. However, as discussed in the present application (page 4, line 21 through page 5, line 3), this conventional alternator is constructed such that the rear-end intake and discharge flow rates are greater than the front-end intake and discharge flow rates (rather than the front-end intake and discharge flow rates are greater than the rear-end intake and discharge flow rates, as claimed). Although the front-end air intake and discharge flow rates and the rear-end air intake and discharge flow rates can be increased by increasing the capacities of the front-end fan and the rear-end fan, respectively, it does not necessarily follow that the rear-end air flow rate is greater than the front-end air flow rate.

As shown in Figure 2 of the present application, if the capacity of the rear-end fan is less than a prescribed capacity, the rear-end air flow rate is less than the front-end air flow rate. Namely, the relationship between the front-end air flow rate and the rear-end air flow rate can be controlled by changing the capacity of the fan. For example, the present invention teaches that the front-end air intake flow rate and the front-end air discharge flow rate can be made larger than the rear-end air intake flow rate and the rear-end air discharge flow rate by configuring the outside diameters, number of blades, blade heights and/or blade chord lengths of the front-end fan and the rear-end fan.

Further, the air flow rate can be reduced by increasing the resistance to the air flow. However, because the resistance to the air flow in the rear-end ventilation pathway is larger than that in the front-end ventilation pathway, it does not necessarily follow that the rear-end air flow rate is less than the front-end air flow rate. Namely, the air flow rate can be changed by changing the capacity of the fan, as shown in Figure 2 of this application.

Furthermore, because the air flows from the front-end side to the rear-end (i.e., a portion of the cooling air entering the front end air intake apertures 1a flows to the rear end through the inside of a rotor 7 and is expelled through the rear-end air discharge apertures 2b), it does not necessarily follow that the front-end air intake flow rate and the front-end air discharge flow rate are larger than the rear-end air intake flow rate and the rear-end air discharge flow rate. The air flows from the inner side of the fan blade to the outer side of the fan blade by rotating the fan, whereby the pressure of the inner side of the fan blade decreases and the pressure of the outer side of the fan blade increases. The pressure of the fan means the pressure of the outer side of the fan blade. Therefore, if the pressure of the rear-end fan is higher than that of the front-end fan, the pressure of the inner side of the rear-end fan is lower than the pressure of the inner side of the front-end fan, whereby the air flows from the front side to the rear side. Consequently, even if the air flows from the front-end to the rear-end, it can not be determined whether the front-end air intake flow rate and the front-end air discharge flow rate are larger than the rear-end air intake flow rate and the rear-end air discharge flow rate.

Since the specification of Hiroshi is silent regarding fan capacity and air flow rate, the Examiner appears to be relying on the principle of inherency in rejecting the claims in view of the drawings of Hiroshi. However, it is well settled that "[t]o establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by person of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). Moreover, "[i]n relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flow from the teaching of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). Lastly, while drawings can anticipate or make obvious the claimed invention, when the reference does not disclose that the drawings are to scale and is silent as to dimensions, arguments based on measurement of the drawing features are of little value. See *Hokerson-Halberstadt, Inc. v. Avia Group Int'l*, 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000).

Accordingly, for the reasons set forth above, Appellant respectfully submits that on the basis of the drawings of Hiroshi, it is not possible to determine whether the front-end air intake and discharge flow rates are larger then the rear-end air intake and discharge flow rates (especially if the Examiner's conjecture is accepted with regards to a capacity of the rear-end fan

being greater than the capacity of the front-end fan). Consequently, Appellant respectfully submits that the Examiner's assertion that Hiroshi teaches that the front-end air intake and discharge flow rates are larger then the rear-end air intake and discharge flow rates is not supported by the disclosure of Hiroshi.

In view of the above, Appellant respectfully submits that independent claims 1 and 14, as well as dependent claims 2-13 and 15-19, should be allowable because the combined references do not teach or suggest all of the features of the claims.

The present Brief on Appeal is being filed in triplicate. Unless a check is submitted herewith for the fee required under 37 C.F.R. §1.192(a) and 1.17(c), please charge said fee to Deposit Account No. 19-4880.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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APPENDIX

CLAIMS 1-19 ON APPEAL:

1. An automotive alternator comprising:

a rotor fastened to a shaft rotatably supported by a front bracket and a rear bracket, said rotor having a pair of Lundell-type pole cores disposed inside said brackets;

a stator supported by said brackets, said stator being disposed so as to cover an outer circumference of said rotor, said stator comprising:

a cylindrical stator core in which a plurality of slots having grooves lying in an axial direction are disposed circumferentially so as to open onto an inner circumferential side; and

a stator coil installed in said stator core so as to constitute a predetermined winding construction;

a pulley fastened to a front end of said shaft; and

a rectifier disposed at a rear end of said rotor,

wherein

a plurality of front-end and rear-end air intake apertures are disposed in axial end surfaces of said front and rear brackets, respectively;

a plurality of front-end and rear-end air discharge apertures are disposed in radial side surfaces of said front and rear brackets, respectively; and

front-end and rear-end blowing means are disposed at front and rear axial ends of said rotor, respectively,

whereby a front-end ventilation pathway in which a cooling air flow flows through said front-end air intake apertures into said front-end bracket and flows out through said front-end air discharge apertures, a rear-end ventilation pathway in which a cooling air flow flows through said rear-end air intake apertures into said rear-end bracket and flows out through said rear-end air discharge apertures, and a front-to-rear ventilation pathway in which a cooling air flow flows through an inner side of said rotor between said front end and said rear end each is generated by operation of said blowing means,

wherein a capacity of said rear-end blowing means is greater than a capacity of said front-end blowing means, and a front-end air intake flow rate is greater than a rear-end air intake flow rate.

2. The automotive alternator according to Claim 1 wherein a front-end air discharge flow rate is greater than a rear-end air discharge flow rate.

3. The automotive alternator according to Claim 1 wherein said front-to-rear ventilation pathway is blocked.

4. The automotive alternator according to Claim 1 wherein said front-end and rear-end blowing means are said Lundell-type pole cores or fans.

5. The automotive alternator according to Claim 1 wherein:

said front-end blowing means is one of said Lundell-type pole cores; and

said rear-end blowing means is a fan.

6. The automotive alternator according to Claim 1 wherein said front-end and rear-end blowing means are fans, each fan comprising:

a generally annular fan base portion;

a plurality of blade base plates extending radially outwards from outer circumferential edge portions of said fan base portion; and

a plurality of blades standing on an outer circumferential edge portion of each of said plurality of blade base plates.

7. The automotive alternator according to Claim 6 wherein said rear-end fan is provided with a greater number of blades than said front-end fan.

8. The automotive alternator according to Claim 6 wherein a maximum blade height of said rear-end fan is greater than a maximum blade height of said front-end fan.

9. The automotive alternator according to Claim 6 wherein said blade base plates of said rear-end fan are formed into a shape which blocks valley portions between adjacent magnetic poles of said rotor.

10. The automotive alternator according to Claim 6 wherein a shielding plate is disposed for blocking air gaps formed by said blade base plates of said rear-end fan and valley portions between adjacent magnetic poles of said rotor.

11. The automotive alternator according to Claim 1 wherein said stator coil is constructed by:

inserting coil segments composed of short conductors formed into a general U shape from a first end of said stator core into slot pairs in which said slots in each pair are a predetermined number of slots apart; and

circumferentially bending and joining together free end portions of said coil segments extending outwards at a second end of said stator core from slots the predetermined number of slots apart so as to constitute the predetermined winding construction,

wherein turn-end coil ends formed by U-shaped turn ends of said coil segments are aligned in rows circumferentially to constitute a turn-end coil end group, and joint-end coil ends formed by said joining of said free end portions of said coil segments are aligned in rows circumferentially to constitute a joint-end coil end group.

12. The automotive alternator according to Claim 11 wherein said joint-end coil end group of said stator coil is disposed at said front end of said stator core.

13. The automotive alternator according to Claim 1 wherein said stator coil is constructed by linking a plurality of winding sub-portions so as to constitute the predetermined winding construction,

wherein each of said winding sub-portions is constituted by one strand of wire constituted by a large number of straight portions housed inside said slots and a large number of turn portions linking together end portions adjacent straight portions outside said slots, said strand of wire being installed in said stator core by housing said straight portions so as to form different layers relative to a slot depth direction in slots the predetermined number of slots apart, and coil ends formed by said turn portions are aligned in rows circumferentially to constitute front-end and rear-end coil end groups of said stator coil.

14. An automotive alternator comprising:

a rotor fastened to a shaft rotatably supported by a front bracket and a rear bracket, said rotor having a pair of Lundell-type pole cores disposed inside said brackets;

a stator supported by said brackets, said stator being disposed so as to cover an outer circumference of said rotor, said stator comprising:

a cylindrical stator core in which a plurality of slots having grooves lying in an axial direction are disposed circumferentially so as to open onto an inner circumferential side; and

a stator coil installed in said stator core so as to constitute a predetermined winding construction;

a pulley fastened to a front end of said shaft; and

a rectifier disposed at a rear end of said rotor,

wherein

a plurality of front-end and rear-end air intake apertures are disposed in axial end surfaces of said front and rear brackets, respectively;

a plurality of front-end and rear-end air discharge apertures are disposed in radial side surfaces of said front and rear brackets, respectively; and

front-end and rear-end blowing means are disposed at front and rear axial ends of said rotor, respectively,

whereby a front-end ventilation pathway in which a cooling air flow flows through said front-end air intake apertures into said front-end bracket and flows out through said front-end air discharge apertures, a rear-end ventilation pathway in which a cooling air flow flows through said rear-end air intake apertures into said rear-end bracket and flows out through said rear-end air discharge apertures, and a front-to-rear ventilation pathway in which a cooling air flow flows through an inner side of said rotor between said front end and said rear end each is generated by operation of said blowing means,

wherein a capacity of said rear-end blowing means is greater than a capacity of said front-end blowing means, and a front-end air discharge flow rate is greater than a rear-end air discharge flow rate.

15. The automotive alternator according to Claim 14 wherein said front-end and rear-end blowing means are fans, each fan comprising:

a generally annular fan base portion;

a plurality of blade base plates extending radially outwards from outer circumferential edge portions of said fan base portion; and

a plurality of blades standing on an outer circumferential edge portion of each of said plurality of blade base plates.

16. The automotive alternator according to Claim 15 wherein said rear-end fan is provided with a greater number of blades than said front-end fan.

17. The automotive alternator according to Claim 15 wherein a maximum blade height of said rear-end fan is greater than a maximum blade height of said front-end fan.

18. The automotive alternator according to Claim 15 wherein said blade base plates of said rear-end fan are formed into a shape which blocks valley portions between adjacent magnetic poles of said rotor.

19. The automotive alternator according to Claim 15 wherein a shielding plate is disposed for blocking air gaps formed by said blade base plates of said rear-end fan and valley portions between adjacent magnetic poles of said rotor.